

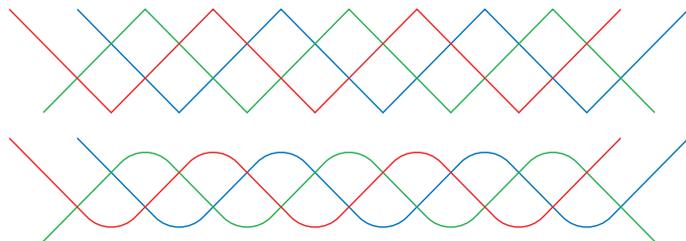
Digital Braiding

To really understand this process, you need to know the definition of a braid. In graphic terms, it's overlapping zigzags with round corners. This holds true for a 3 strand braid, a 4 strand braid, a 5 strand braid, and a 100 strand braid. The braids can then be converted to repeatable patterns, and defined as patterns to be used for brushes. As the braids get more complex, they look like pieces of fabric woven on the bias.

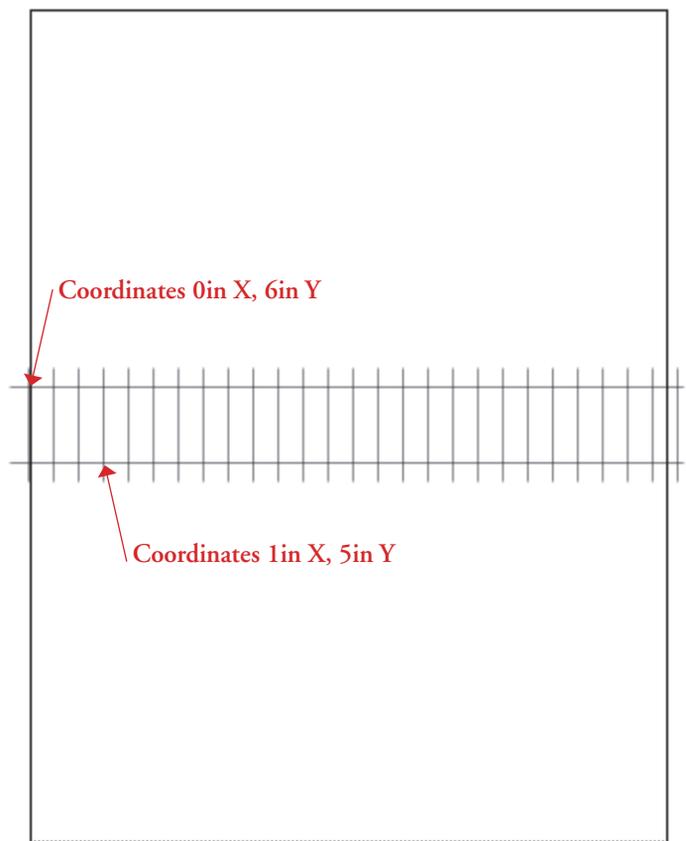
The first time I sat down to map out a braid, it was brutally difficult. Even though I did complete what I had set out to do. Any expert scrutiny would have called it cheesy. This method came to me quite unexpectedly one day when I was experimenting, I get free time once in a while. When finished, the object looked like a deformed 4 strand braid. It took a little thought, and I was able to adapt the technique for a braid with any number of strands.

Step 1: Create a new file in illustrator, use the default letter size. Place a horizontal line on the art board, it should be 9 inches long, the center coordinates should be 4.25in X and 5.0in Y. The lines will go outside the page area, this is acceptable. Place another line at 4.25in X and 6.0in Y. Select both lines, and Control + Click the art board (Mac), or right click (Win), and choose make guides from the pop up menu.

Step 2: Make a vertical line 1.5 inches tall, the center coordinates should be 0in X and 5.5in Y. Press V on the keyboard to get quick access to the Selection Tool, press enter, this brings up the Move dialog box, you may also double click the black arrow. For Position Section of the dialog box, the value for the Horizontal box should be 1in/3, the Vertical box should read 0, Distance and Angle are filled in based on the Horizontal and Vertical

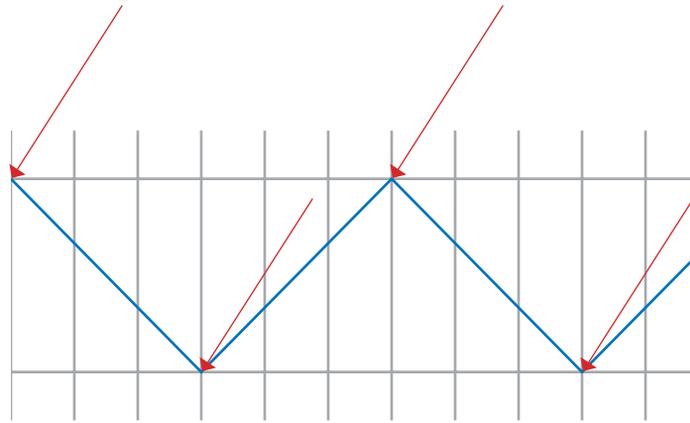


The definition of a braid, in graphic terms, a woven zigzag with round corners. You can see the braid taking shape in the bottom of the two images here. This paper will outline the steps and the process for finishing out the braid.



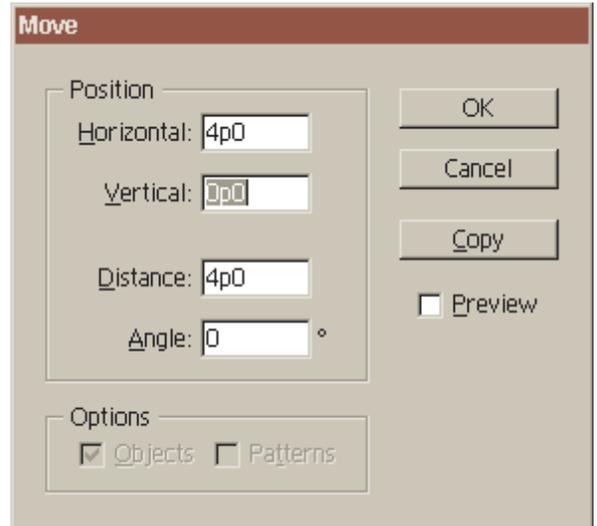
A sample of the layout guides for creating a 3-strand braid.

values, click the copy button. You should see a second vertical line. To get vertical lines going the width of the art board, use the Command/Control D keystroke to repeat the lines until you have enough. If you go one line over the art board boundaries, it won't cause any problems. Select the vertical lines and convert them to guides. The Pen Tool snaps to the guide intersections that cross each other like a railroad track, better than snapping to a point at the end of a guide. Make a new layer, when you expand the pivot triangle for Layer 1, you will see that each guide is a sub-layer. It is my preference to put artwork on a separate layer from the guides, because of this.



The arrows mark 1 inch increments. The first point is placed at 0in X and 6in Y, the second point is placed at 1in X and 5in Y. Zigzag on every third line.

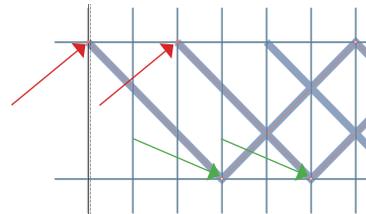
Step 3: Use the Pen Tool, place a point on the left side of the top guide line, 0in X, 6in Y coordinates. Move to the right, 1 inch, and place a point on the bottom guide line, 1in X, 5in Y coordinates. Zigzag the line until you run out of bar guides.



Step 4: Select the zigzag line, if a portion of the line is selected, it will not transform correctly. Use the Selection Tool (V), and press enter to bring up the dialog box, input 4p0 for the Horizontal value, and click the copy button. Use the Command/Control D keystroke to get a second copy. Even though you may be using inches as the default ruler scale, you want to move the line $\frac{2}{3}$ of an inch. The value 4p0 represents 4 picas, 0 points, and 4 picas is $\frac{2}{3}$ of an inch, so without changing your default ruler units, you can input a value from another unit of measure and get the desired result.

Yes I'm guilty of a preference to Pica Units. At the same time, if I need to move an object $\frac{3}{8}$ of an inch, I could put a value of .375in for the Horizontal value, press copy, and it would step $\frac{3}{8}$ of an inch. Illustrator is good at handling measurements that way, InDesign does that as well.

Step 5: Use the Direct Selection Tool (A), and select the two points to the far left to delete, and the same with three points on the far right. When the braid is complete, this will give the braid ends a frayed look. Select all three lines, and from the overhead menu, Filter > Stylize > Round Corners. Input a value of .5in. The Round Corner value will change the shape of the braid. Higher



The Red arrows point to solid blocks that have been selected by the Direct Selection Tool. The Green arrows point to hollow blocks on the same path that have not been selected, the hollow block are not affected by deleting the selection of solid blocks.



values for Round Corners gives a narrow and tight braid, lower values give a wide and loose braid.

Step 6: With the lines still selected, increase the stroke to 27pt. Zoom in, you'll see small white triangles between the rounded zigzags. If the stroke were increased to 28pt, the lines would overlap, and the braid process would fail. If you wish, the stroke value of the lines may be reduced, giving a loose look to the braid. Object > Expand from the overhead menu. AI9 users will have to expand the lines one at a time.

Step 7: Open the Pathfinder Palette, and access the palette menu by the right pointing triangle in the upper right corner. Choose the Pathfinder options from the menu, and check off the option Divide and Outline Will Remove Unpainted Artwork. Then click the Divide option on the Pathfinder Menu. Press D for default colors, so that you can see the outlines of the pieces when the segments are deselected.

Step 8: Expand the pivot triangle on the left side of Layer 2. Select the artwork, and Object > Ungroup from the menu (Command/Control +.Shift +G). Ungrouping the artwork allows you to use the Direct Selection Tool (A) or the Selection Tool (V). Selecting individual paths from a Group, you need to use the Direct Selection Tool (A). Starting from the top left, select three segments and change the fill to red. Group the segments and double click the group name in the Layers Palette, rename Red Group. In selecting the next three segments to group, start from the bottom, where the red is woven under the next group. Set the fill to green, group, and rename to Green Group. That leaves a single segment on the left, select it, follow the weave, and select the next three segments that come up on the other side of the red strand. Change color to blue, group, and rename Blue Group. Follow each strand through the weave, and add red segments to the Red Group, green segments to the



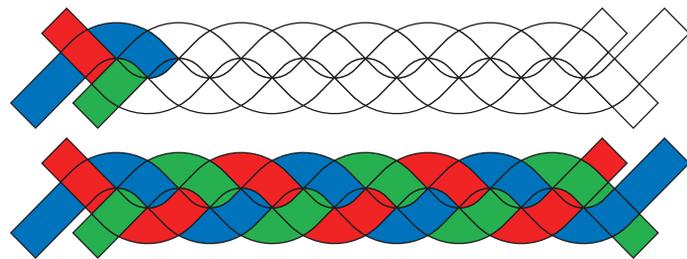
Round Corners Dialog box: Filter > Stylize > Round Corners



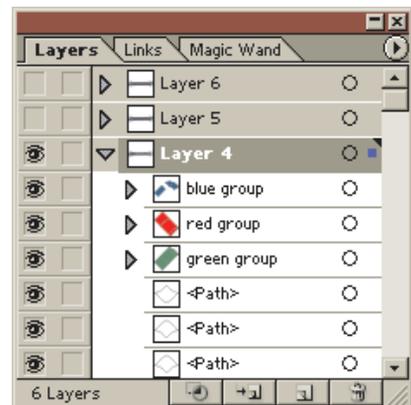
Once the corners have been Rounded, increase the Stroke value to 27 pt. When you zoom in to the document, you should see small areas of space between the lines. If the space isn't there, the braid will fail. The Stroke value can be varied, as long as there is space between the lines.



When the Divide Option is used from the Pathfinder menu, it creates unpainted paths from empty areas, like the small triangular spaces between the braid lines. Unpainted paths can cause problems for this project.



Grouping the segments by color is a good way to get familiar with the braid process. This step isn't critical, it's a good practice for getting a look at the final picture.



Green Group, and blue segments to the Blue Group. Once all the colors are assigned, you may use the Wand Tool for grouping, moving the segments into each of the color groups.

Step 9: Use the Wand Tool and select all the Blue segments. Press Alt, and click Add to Area Shape from the Pathfinder menu. This will create unite all the paths in one easy click. Repeat with Red and Green groups. If you want to apply a style to the segments, ungroup first.

Step 10: Not all braid patterns need to repeat, but for those that do, here are the steps to follow. Repeating the pattern. Prepare the pattern by unlocking all the segments. Object > Unlock All. The stroke on the segments is 1 pt, this can be increased or decreased according to the individual prefs. I'm going to increase the stroke to 2 pt. Object > Expand, then Divide from the Pathfinder menu. If you expand the layer, you'll notice several additional paths. Deselect all paths, select the Wand tool from the Tool palette. Zoom in, and click on a black path. The Wand will select all black segments. Command/Control X to delete. The divide left some small slivered paths around the braid segments. Delete these too. If you'll click on the right side of the object bar, you can easily select the unwanted paths to delete. Shift clicking the path bars will add to the selection.

Step 11: Depending on how the braid is going to look will depend on how you repeat the pattern. Notice the three pointers above the braid. From the black pointer on the left, to the black pointer on the right, indicates a repeating pattern with each strand a different color. If you plan to make a braid pattern with a single color, change the fill on all segments to black then the repeat would be from the black left pointer to the red pointer. It's no accident that the pattern can be sliced according to the vertical guides. The purple pointer below the braid pattern points at the first green segment. The angle

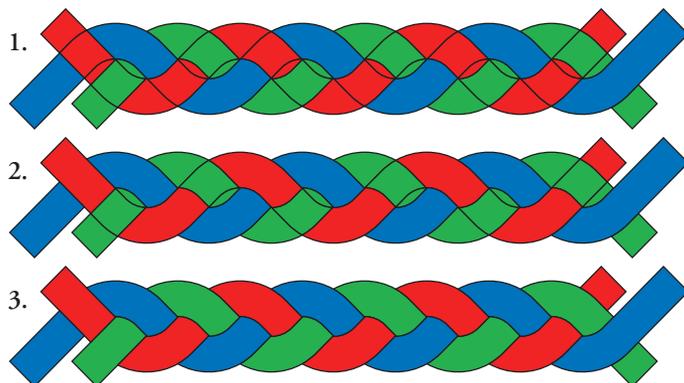
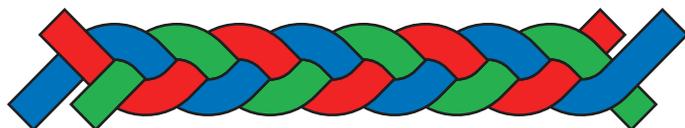


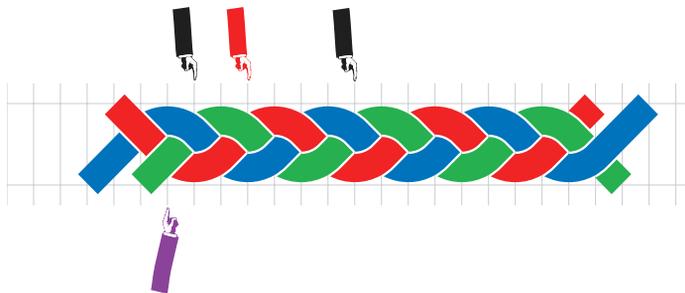
Image 1: United Blue Strand. Image 2: United Red Strand. Image 3: United Green Strand.



The stroke was increase to 2 pt, the graphic expanded, and paths Divided.



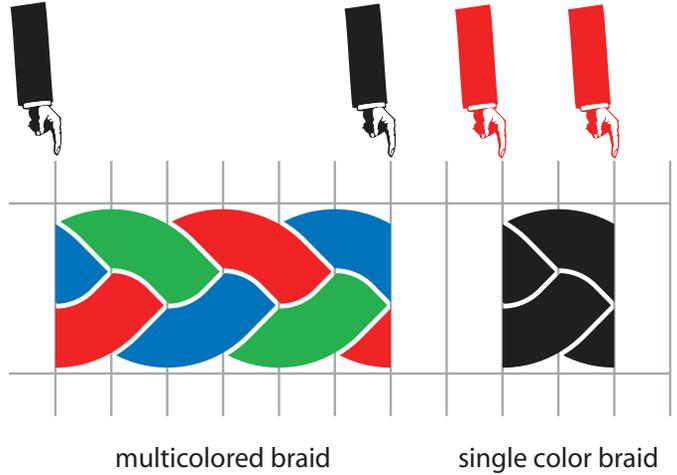
The black filled paths were selected and deleted.



Notice that the guides make natural markers to help you determine the length of the repeating pattern. I'll admit to using a brush stroke for placing pointers. I could have used small circles or blocks. Because this pattern was based on AI Math, the pattern is twice the distance of two guidelines. The distance of 6 guidelines for a multicolored braid.

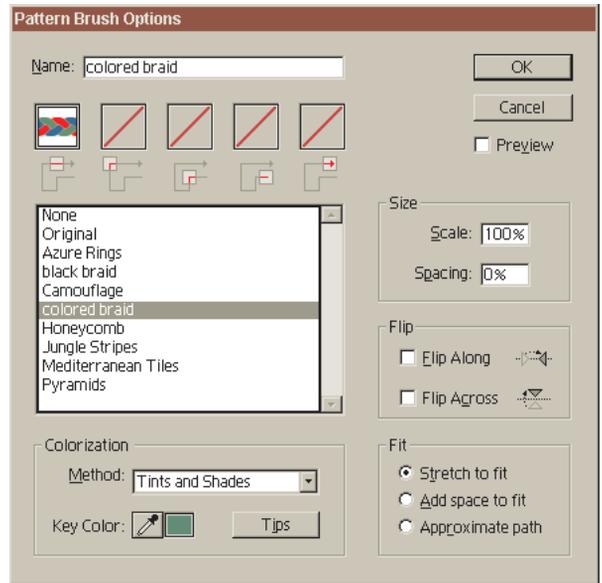


on this first segment will not align as a repeating pattern, due to it's angle. Put a marker, small circle, over the guides you're planning to use to mark your repeating pattern. Until you are familiar with the process, this will be helpful. Use the Line Tool, and place a vertical line over the guide under the black pointer on the left, then do the same with the black pointer on the right. The lines have to be straight or the pattern will not line up. Select the lines and the braid, click Divide from the Pathfinder Palette. Use the Direct Selection Tool (A), and select segments left of the black marker on the left, and segments to the right of the right marker. Shown are the repeating patterns for a single color braid, and a three color braid.



The repeating segments of the braid strand are shown. The 3-strand segment could be set up as a single color. A single segment, like the one on the right, cannot be set up as a multi-colored strand.

Step 12: Select the Braid segment, Edit > Define Pattern from the overhead menu. Open the Brush Palette and make a new pattern brush. Experiment with the color settings on the Pattern Brush Dialog box.



Select the colored strand, Edit > Define Pattern, name it colored braid. Then from the Brush Palette, click the New Brush icon, and select Pattern Brush from the options. Select the pattern from the list. Only the straight segment of the brush needs to be defined. The frayed edges can be defined as patterns for the start and finish of the brush strokes. For Colorization, I chose Tints and Shades, experiment with the different color settings.



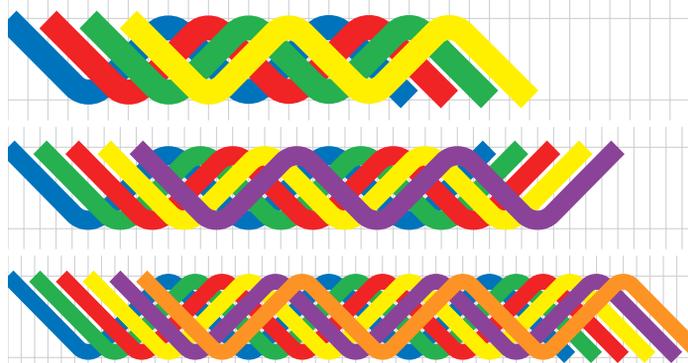


Step 13: Test the brush, by making a new layer and placing a circle, a hexagon and a square on the new layer. The square and the hexagon will not have corners when the brush is applied. The corners will need to be rounded to get the braid to connect around the corners. The math involved in making a corner brush for a braid hasn't presented itself at this time. Corners can be rounded by either of these methods, Filter > Stylize > Round Corners or Effect > Stylize > Round Corners. You may want to use an Effect here, so that you can modify the Round Corners value without changing the path. Depending on how well the corners line up, depends on the Round Corner value, and the Stroke value on the path you're stroking. If you open the Stroke palette, and enter a value of .5 for the stroke, the width of the brush stroke will decrease.

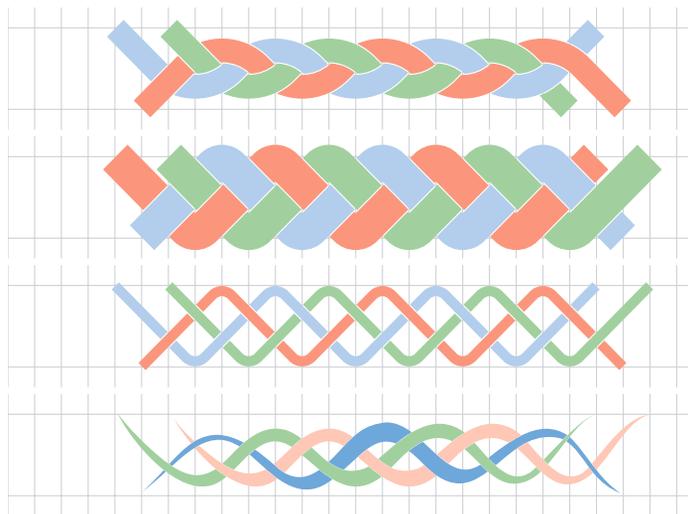




Notes: Even on a circle path, there will be some brush distortion, it is a natural phenomenon for real braids. Some sample images on setting up a 4, 5 and 6 strand braid here. Specialized brush strokes can be used to add unique properties to the strands, if you can't get a repeating pattern, make one long strand for your artwork. The limiting factors here, will be what you decide can and can not be done. Also shown are samples based on the braid template set up in this document, they were varied by Stroke weight, Round Corner input, and Brush strokes.



The spacing of the guides may vary. The step value for a zigzag line will be twice the distance of two guides. The 4 strand braid was set up on a $\frac{1}{4}$ inch grid, the 5 strand on a $\frac{1}{5}$ inch grid and the 6 strand on $\frac{1}{6}$ inch grid. The Round Corner value is variable, and don't be afraid to experiment. A higher Round Corner value will give a result similar to Sample 1, below. A lower value will give a result similar to Sample 2, below.



The samples here are based on the grid set up for the tutorial, 3 guides per inch. the Stroke/Round Corner options varied for samples 1, 2 & 3. Sample 4 is an example of a non-repeating braid made from the same grid. Each strand had a custom brush applied, the brush strokes were expanded, and the strands divided the same way the other patterns were created. So be creative and get artzy.